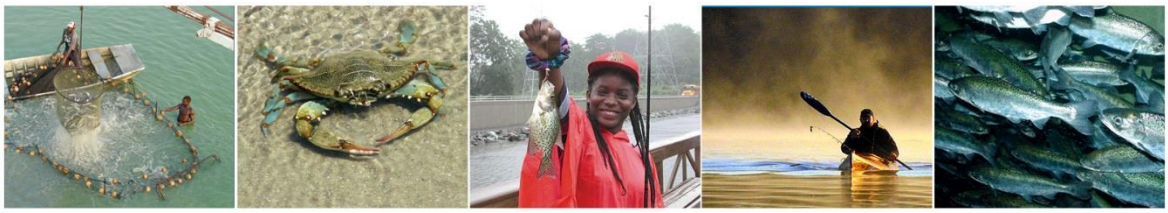
EPA United States Environmental Protection Agency



Fish and Shellfish Program NEWSLETTER

March 2019
EPA 823-N-19-002

In This Issue

https://www.epa.gov/fish-tech

Recent Advisory News

New Jersey Updates Fish Consumption Advisories for Lower Delaware River Watershed, Expands Testing to Include PFAS

On July 19, 2018, the New Jersey Department of Environmental Protection (DEP), in partnership with the New Jersey Department of Health, announced the update of recreational fish advisories for tributaries, lakes, and ponds in the lower Delaware River watershed as part of the state's ongoing fish-safety monitoring program.

Testing for PFAS

The DEP has also expanded testing of fish in selected water bodies in this and other regions of the state to include several chemicals of emerging concern known as perfluoroalkyl and polyfluoroalkyl substances, or PFAS. These analyses have resulted in the DEP's first consumption advisories for these chemicals.

"Before going fishing, anglers should take a few minutes to review advisories in place for their favorite fishing spots so they can make good decisions about eating the fish they catch," said DEP Commissioner Catherine R. McCabe.

Due to growing concerns over the presence of PFAS in the environment, the DEP sampled water, sediment, and fish tissue samples from a limited number of waterbodies in the lower Delaware River watershed and other regions of the state.

Waterbodies were selected based on their proximity to potential sources of PFAS and their likelihood of being used for recreational and fishing purposes. PFAS were detected at varying levels and combinations in all the waterbodies tested.

PFAS – which include the compounds perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), and perfluorononanoic acid (PFNA) – were once widely used in a variety of applications, including non-stick cookware, stain-resistant clothing and fabrics, food packaging, and firefighting foams. These chemicals are persistent in the environment and can accumulate in people exposed to them.

Waterbodies tested for PFAS included:

- Passaic River in Passaic County
- Raritan River in Bergen and Passaic counties
- Metedeconk River in Ocean County
- Several lakes adjacent to Joint Base McGuire-Dix-Lakehurst in Burlington and Ocean counties
- North Branch of Rancocas Creek in Burlington County
- Woodbury Creek in Gloucester County
- Fenwick Creek in Salem County
- Cohansey River in Cumberland County

"The DEP will continue to assess other waterbodies for these chemicals and will integrate results and recommendations into the routine consumption advisories that we update regularly," said Gary Buchanan, Director of the DEP's Division of Science, Research and Environmental Health.

All states have fish consumption advisories. Many of the fish on New Jersey's advisory lists are typically caught and released without being consumed, but some people rely on some of the species on the advisory lists as a food source.

"Fishing provides enjoyable and relaxing recreation, and we know many people enjoy cooking and eating their own catch," New Jersey Health Commissioner Dr. Shereef Elnahal said. "However, certain fish may contain contaminants and pose serious health risks like cancer and nervous system issues. It is a good idea to follow these advisories when consuming recreationally caught fish and crabs, particularly if you eat them often."

The DEP and Department of Health advise all anglers to get the latest advisories for the specific waterbody they fish by visiting www.fishsmarteatsmartnj.org.

Testing for Other Chemicals

The DEP tested 11 fish species in the following 14 waterbodies in Burlington, Camden, Cumberland, Gloucester, Ocean, and Salem counties for polychlorinated biphenyls (PCBs), mercury, and pesticides:

- Big Timber Creek along the border of Camden and Gloucester counties
- Cooper River Lake
- Kirkwood Lake
- Newton Lake and Pennsauken Creek in Camden County
- Mantua Creek Stewart Lake and Wilson Lake in Gloucester County
- U.S. Department of Defense Ponds in Salem County
- Rancocas Creek and Strawbridge Lake in Burlington County
- Maurice River and Union Lake in Cumberland County
- Prospertown Lake in Ocean County

The fish species sampled varied depending on location and included largemouth bass, bluegill sunfish, common carp, white perch, channel catfish, pumpkinseed, striped bass, chain pickerel, yellow bullhead, brown bullhead, and white catfish.

As is typical, the latest sampling found the highest mercury concentrations in species at the top of the food chain, such as chain pickerel and largemouth bass, while the highest PCB concentrations were found in bottom feeders,

such as channel catfish and common carp. PCBs were generally detected at relatively low levels. Pesticides were found at only very low levels.

The testing resulted in less restrictive advisories for 36 species than had been in place, while 24 saw no change. Ten advisories are now more restrictive.

Data were also collected for species not tested in previous years as well as at one new sample location. The new data resulted in 30 new consumption advisories for the lower Delaware River watershed region.

While water quality in New Jersey continues to improve, past pollution can persist for many years in sediments and continue to accumulate in fish at or near the top of the aquatic food chain.

Fish are an excellent source of protein, minerals and vitamins, and help maintain a healthy, well-balanced diet. The American Heart Association recommends that people eat fish regularly. Fish are also one of the few foods that are rich in omega-3 fatty acids needed for proper development of the brain and nervous system in the fetus and infants and may reduce the risk of heart attack.

However, due to past use of PCBs and pesticides, as well as deposition of mercury from various sources, some recreationally caught fish can be unhealthy for children or some adults with certain health concerns.

Public Outreach and Advisories Continue

The DEP and Department of Health have been issuing fish consumption advisories since 1983 and have been updating them on a regular basis. Advisories include statewide, regional, and waterbody-specific advice as well as a general advisory for freshwater fish. These advisories allow the public to make informed choices about the fish they catch and eat.

The state's ongoing public outreach activities include responding to online and telephone inquiries from the public and distributing outreach materials to all New Jersey Women, Infants, and Children centers in English and Spanish. Information is also sent to recreational anglers, local and county health departments, and other stakeholders.

For much of the population, advisories can range from no restrictions to a recommendation to limit consumption to one meal per week. For the high-risk population – which includes pregnant women, women planning to become pregnant, nursing mothers, infants and children – advisories can range from no more than one meal per week to do not eat.

If you choose to eat those species under advisories, there are steps you can take to reduce your exposure. Proper cleaning and cooking techniques, which remove some of the fat from the fish, can significantly reduce levels of PCBs and organic chemicals. However, these techniques will not reduce or remove unsafe levels of mercury from fish.

For all freshwater fish and waters not covered by consumption advisories, consumers should follow the DEP's general freshwater advisories, which recommend eating no more than one meal per week for the general population and no more than one meal a month for high-risk individuals.

For the DEP's PFAS study report, visit www.nj.gov/dep/dsr/.

For more information, contact Lawrence Hajna at (609) 984-1795 or Caryn Shinske at (609) 984-1795.

Source: https://www.nj.gov/dep/newsrel/2018/18_0063.htm

EPA News

EPA Acting Administrator Announces First-Ever Comprehensive Nationwide PFAS Action Plan

On February 14, 2019, the U.S. Environmental Protection Agency (EPA) then Acting Administrator Andrew Wheeler announced EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan. This historic PFAS Action Plan responds to extensive public interest and input the Agency has received over the past year and represents the first time EPA has built a multi-media, multi-program, national communication and research plan to address an emerging environmental challenge like PFAS. EPA's Action Plan identifies both short-term solutions for addressing these chemicals and long-term strategies that will help provide the tools and technologies states, tribes, and local communities need to provide clean and safe drinking water to their residents and to address PFAS at the source—even before they get into the water.

"The PFAS Action Plan is the most comprehensive cross-agency plan to address an emerging chemical of concern ever undertaken by EPA," said EPA Acting Administrator Andrew Wheeler. "For the first time in Agency history, we utilized all of our program offices to construct an all-encompassing plan to help states and local communities address PFAS and protect our nation's drinking water. We are moving forward with several important actions, including the maximum contaminant level process, that will help affected communities better monitor, detect, and address PFAS."

The Action Plan describes long- and short-term actions that the EPA is taking including:

- **Drinking water:** EPA is committed to following the maximum contaminant level rulemaking process as established by the Safe Drinking Water Act. By the end of this year, EPA will propose a regulatory determination for PFOA and PFOS. The Agency is also gathering and evaluating information to determine if regulation is appropriate for other chemicals in the PFAS family.

- **Clean up:** EPA has already begun the regulatory development process for listing PFOA and PFOS as hazardous substances and will issue interim groundwater cleanup recommendations for sites contaminated with PFOA and PFOS. This important work will provide additional tools to help states and communities address existing contamination and enhance the ability to hold responsible parties accountable.

- **Enforcement:** EPA will use available enforcement tools to address PFAS exposure in the environment and assist states in enforcement activities.

- **Monitoring:** EPA will propose to include PFAS in nationwide drinking water monitoring under the next Unregulated Contaminant Monitoring Program. The agency will also consider PFAS chemicals for listing in the Toxics Release Inventory to help the agency identify where these chemicals are being released.

- **Research:** EPA will develop new analytical methods so that more PFAS chemicals can be detected in drinking water, in soil, and in groundwater. These efforts will improve EPA's ability to monitor and assess potential risks. EPA's research efforts also include developing new technologies and treatment options to remove PFAS from drinking water at contaminated sites.

- **Risk Communications:** EPA will work across the agency—and the federal government—to develop a PFAS risk communication toolbox that includes materials that states, tribes, and local partners can use to effectively communicate with the public.

Together, these efforts will help EPA and its partners identify and better understand PFAS contaminants generally, clean up current PFAS contamination, prevent future contamination, and effectively communicate risk with the public. To implement the Action Plan, EPA will continue to work in close coordination with multiple entities, including other federal agencies, states, tribes, local governments, water utilities, industry, and the public.

For more information, visit www.epa.gov/pfas.

Background

In May 2018, EPA convened a two-day National Leadership Summit on PFAS in Washington, D.C. that brought together more than 200 federal, state, and local leaders from across the country to discuss steps to address PFAS. Following the Summit, the agency hosted a series of visits during the summer of 2018 in communities directly impacted by PFAS. EPA interacted with more than 1,000 people during community engagement events in Exeter, New Hampshire, Horsham, Pennsylvania, Colorado Springs, Colorado, Fayetteville, North Carolina, and Leavenworth, Kansas, as well as through a roundtable in Kalamazoo, Michigan, and events with tribal representatives in Spokane, Washington. The Action Plan was developed based on feedback from these events in addition to information received from approximately 120,000 comments submitted to the public docket.

For more information, contact the Office of Ground Water and Drinking Water at safewater@epa.gov.

Source: https://www.epa.gov/newsreleases/epa-acting-administrator-announces-first-ever-comprehensive-nationwide-pfas-action-plan

Other News

Pearl in the Making

Although oysters are not laying "as thick as stones" as described in the days of the 17th century explorer, Captain John Smith, Jason Ruth knows that oysters may be staging a small comeback in a segment of the Chesapeake Bay — thanks, in part, to the U.S. Fish and Wildlife Service (USFWS). For several years, USFWS has been helping local

communities create new oyster beds as well as restore some stretches of shoreline. That's good economic news for Ruth and the watermen who make their living on the bay. Conservation, they know, can be good for business.

Restoring Oysters, Shoreline

Ruth comes from a waterman family, the latest in a line who have made their living on the Chesapeake.

When he was 13, Ruth got a job at Harris Seafood Company. Founded decades ago, the seafood packer once shucked 1,900 gallons of oysters in one day.

An industry once under pressure from over-harvesting and pollution suffered a large setback in the 1980s when dermo and MSX struck oyster beds. The diseases decimated oyster populations. One by one, the seafood-packing houses on Kent Island closed until only Ruth's remained.

Today, oyster populations and the industry show signs of recovery in large part due to oyster and habitat conservation efforts. Harris Seafood company operates year-round, employing 57 people while supporting 250 watermen and generates between $25 to $30 million annually.

The value of oysters wasn't lost on David Sutherland, a biologist in the USFWS's Coastal Program. For the last few years, he has been working with the Chesapeake Bay Environmental Center (CBEC), a nonprofit dedicated to improving the water quality and reducing habitat loss in the Chesapeake Bay watershed, to recover oysters and restore shoreline on Kent Island and the surrounding area.

It's important work. Having healthy oysters has profound implications for the environment as well as the wallet: one oyster can filter 50 gallons of water each day. Thriving oysters means cleaner water.

One oyster project is placing reef balls in a 287-acre stretch of the bay to promote the bivalves' growth. Calling the structures "balls" is a bit misleading: Each is shaped vaguely like a pine cone, with an opening at the top and along the sides that allow water to whoosh through.

Built of concrete, the balls vary from two to six feet tall, Sutherland said. Some "definitely need to be moved by crane," he said.

USFWS helped prepare reef balls that were placed in an oyster sanctuary adjacent to CBEC. Scientists soaked them in containers filled with water and spat, or oyster larvae. The larvae attach to the concrete balls, which are placed in the bay. As successive generations of spat mature into adult oysters, they form oyster reefs. The prognosis so far? "They're doing great," Sutherland said.

Another benefit of oysters: They help keep shorelines intact. Oyster beds, scientists know, can reduce the force of waves hitting shore. The increase in sea levels, storm surges, and even shipping vessels in the bay have eroded some areas of shoreline. A thriving oyster population, Sutherland said, lessens that impact.

Oyster beds also provide habitat for fish, crabs, and other aquatic species. Foraging ducks, cormorants, and other water birds thrive alongside oysters.

Easiest to Work With

Vicki Paulas is assistant director of CBEC. Paulas has worked closely with USFWS — Sutherland in particular — to improve oyster populations in the upper bay.

Over the years, they've planted more than 10 million spat. The Maryland Department of Natural Resources, Maryland Artificial Reef Initiative and the Coastal Conservation Association have helped.

In 2013, Paulas was looking for new funding sources. She came up with the idea to establish an oyster lease and commercially grow oysters. From this sprung a partnership: a group comprising the CBEC, Harris Seafood, local watermen, and USFWS.

CBEC had the spot — a site in its oyster sanctuary. Harris Seafood had the spat — Ruth, the owner, bought 600,000 growing on oyster shells. Watermen had the muscle — they planted the spat-laded shells. USFWS offered its coastal expertise.

The oysters were harvested in the Fall of 2018.

A pile of rough oyster shells partially covered in sediment. *(Image courtesy of USFWS)*

For more information, contact Samantha Brooke, samantha_brooke@fws.gov, 703-358-1829.

Research Brief 288: Alternative Flame Retardants May Lead to Neurobehavioral Effects

On December 5, 2018, the Superfund Research Program of the National Institute of Environmental Health Sciences published a research brief that found that organophosphate flame retardant (OPFR) exposure early in life may be linked to behavioral impacts into adulthood, according to a new study in zebrafish. The results provide evidence that OPFRs, which have been introduced in commercial products in the past decade, may not be a safe alternative to brominated flame retardants, which were phased out because they were found to be harmful to normal development.

Duke University Superfund Research Program (Duke SRP) Center researchers led by Lilah Glazer, Ph.D., and Edward Levin, Ph.D., used zebrafish to characterize the life-long neurobehavioral effects of four widely used OPFRs. In the last ten years, indoor and outdoor levels of OPFRs have increased, and these compounds and their metabolites have been detected in house dust samples and human populations. The Duke SRP Center investigates how early-life exposure to priority and emerging chemicals of concern, including flame retardants, can lead to neurodevelopmental effects.

Identifying Behavioral Effects

The researchers investigated behavioral changes of zebrafish in response to early-life exposure to four OPFRs: isopropylated phenyl phosphate (IPP), butylphenyl diphenyl phosphate (BPDP), 2-ethylhexyl diphenyl phosphate (EHDP), and isodecyl diphenyl phosphate (IDDP). Zebrafish, which share many molecular, biochemical, cellular, and physiological characteristics with humans, have been widely used to study how exposure to toxic chemicals influences development and behavior.

The researchers exposed zebrafish embryos to the OPFRs at different concentrations for five days. On day six, they measured the fish's ability to move around under alternating light and dark conditions. The test can show how the fish responds to a change in stimuli, where limited or excess movement can indicate an overall change in behavior. At five to seven months, the adult zebrafish were given a variety of behavioral tests that assess anxiety-related responses, sensorimotor response, social interaction, and predator evasion.

Adult zebrafish underwent a variety of behavioral tests, including one examining their preference for social interaction with other zebrafish. *(Image courtesy of EPA)*

The researchers observed short-term effects of altered movement in larvae in all the tested compounds. They also observed long-term impairment of anxiety-related behaviors in adults following IPP, BPDP, or EHDP exposures. Of the four OPFRs, IPP was the most active in causing behavioral alterations in both larvae and adult fish, including increased movement of larvae and reduced response to anxiety-promoting situations in adults. In contrast to IPP, the main effect observed for BPDP and EHDP was increased anxiety-related response to a new environment.

Making Predictions Moving Forward

Comparing the responses from each of the four chemicals, the researchers determined that the structure of the chemicals did not necessarily predict their neurobehavioral effects. For example, IPP and BPDP have structural similarities but caused very different behavioral effects in larvae and adults, indicating different pathways of toxicity. Additionally, BPDP and EHDP, which are different in their chemical structure, caused similar behavioral alterations in zebrafish. As scientists are investigating ways to predict toxicity of poorly characterized chemicals based on structural similarities to known chemicals, the results of this screen suggest that predicting toxicity based on structural similarities may miss some impacts.

The researchers also observed behavior alterations in adults at lower concentrations of IPP and BPDP but did not see changes in larvae activity, suggesting a delayed effect for these chemicals at low exposure levels. Larval behavior testing is a popular endpoint when using zebrafish but according to the authors, this study indicates that using larval testing alone may underestimate the neurotoxicity of some chemicals that have delayed effects.

The earlier class of brominated flame retardants, which became popular in the 1970s, were phased out in the 2000s and replaced with OPFRs because the former were found to be developmental neurotoxicants. This study provides evidence that OPFRs may also have neurotoxic effects at low exposure levels. These effects, which may be similar or

different in character from those caused by brominated flame retardants, could result in behavioral impacts that last into adulthood.

For more information, contact Edward D. Levin at (919) 681-6273 or edlevin@duke.edu.

Reference: Glazer L., A.B. Hawkey, C. Wells, M. Drastal, K. Odamah, M. Behl, and E.D. Levin. 2018. Developmental exposure to low concentrations of organophosphate flame retardants causes life-long behavioral alterations in zebrafish. *Toxicological Sciences* 165(2):487-498. doi:10.1093/toxsci/kfy173, PMID:29982741, PMCID:PMC6154272

Source: https://tools.niehs.nih.gov/srp/researchbriefs/view.cfm?Brief_ID=288

Recently Awarded Research

National Fish and Wildlife Foundation Announces $940,000 in Grants from Southeast Aquatics Fund

On December 11, 2018, the National Fish and Wildlife Foundation (NFWF) announced $940,000 in grants to conserve and restore habitats for native freshwater aquatic species in focal watersheds within Alabama, Florida, and Georgia. The grants will leverage $1.1 million in matching contributions, generating a total conservation impact of more than $2 million.

"The Southeast is home to the greatest diversity of freshwater species in the country, many of which are becoming increasingly rare," said Jeff Trandahl, executive director and CEO of NFWF. "Generating measurable results for the wildlife of Southeastern streams and rivers requires collaboration between the public and private sectors, both in terms of funding and also the ability to coordinate efforts across public and private lands."

Black Warrior waterdog. *(Image courtesy of USFWS)*

The grants were awarded through the Southeast Aquatics Fund, a partnership between NFWF and the U.S. Department of Agriculture Forest Service and Natural Resources Conservation Service (NRCS), USFWS, and Southern Company.

The projects supported by the six grants announced will benefit more than 30 miles of streams and improve the connectivity of aquatic habitats in the Alabama-Mobile-Tombigbee Basin and the Apalachicola-Chattahoochee-Flint Basin. These were identified as priority watersheds due to their high conservation need and the viable opportunities they present for restoration and management strategies that address the key threats aquatic species face in their waters.

The projects also will boost populations of freshwater mussels through propagation and augmentation, support efforts by private landowners and farmers to boost water quality and quantity and support the collection of data on key species to inform future conservation actions.

A complete list of the 2018 grants made through the Southeast Aquatics Fund is available here.

“These grants from the Southeast Aquatics Fund will accelerate critical work on public and private lands that will help promote productive soils, biological diversity, and threatened and endangered species habitats,” said Ken Arney, acting regional forester for the southern region of the U.S. Forest Service. “We are proud to be a partner in this effort because we know we cannot achieve our restoration and conservation objectives, or healthy forests, without a strategic approach to watershed conservation.”

"We’ve got some of the most incredible natural places in the world and many of them are right here in these three southeastern states,” said Leo Miranda, USFWS’s Southeast regional director. “The work we are doing with these partners, state agencies, and private landowners to take care of our waters and wildlife recognizes the recreational, economic, and conservation values that are so important to our way of life. We’re excited to be a part of the partnership to do good and targeted conservation.”

“Partnerships like this one are crucial for improving the health of aquatic ecosystems,” said NRCS Acting Chief Leonard Jordan. “We are grateful to the National Fish and Wildlife Foundation and our many partners for coming together to improve water quality and habitat on public and private lands. We’ve seen firsthand how farmers and private landowners are voluntarily making conservation improvements to their land, benefiting a variety of aquatic species like bridled and holiday darters.”

"It's a privilege to sponsor projects recovering native aquatic species and restoring critical watersheds in the Southeast,” said Jeff Burleson, Southern Company’s environmental and system planning vice president. “Southern Company is committed to supporting initiatives that enrich the communities we serve by protecting our natural resources for current and future generations.”

Launched in 2017, the Southeast Aquatics Fund is a competitive grants program that supports watershed-based restoration to improve the health of aquatic systems and secure populations of native freshwater aquatic species. In its first year, the fund awarded $700,000 to five conservation projects expected to restore two miles of stream habitat, prioritize more than 200 culverts and barriers for removal, and develop protocols to detect mussels and their host fish using eDNA monitoring.

Source: https://www.nfwf.org/whoweare/mediacenter/pr/Pages/national-fish-and-wildlife-foundation-announces-940-000-in-grants-from-southeast-aquatics-fund-2018-1211.aspx

Tech and Tools

Re-establishing Oyster Beds to Maximize Their Ecological Benefits

On February 11, 2019, ScienceDaily reported that researchers from North Carolina State University (NC State) have developed a mapping tool that identifies sites for re-establishing oyster reefs that maximize their ecological benefits, such as water filtration. This Geographic Information Systems (GIS)-based tool could inform restoration of other vital, sensitive coastal habitats.

Oyster reefs, salt marshes, and seagrass beds provide valuable ecosystem services such as water filtration, shoreline protection, and wave buffering during storm events. When these habitats are damaged, restoration efforts are critical to their recovery and to the overall health of coastal ecosystems and communities. However, not all coastal habitats are created equal, and where restoration or conservation efforts take place makes a big difference in the quantity and quality of ecosystem services delivered.

"This work focused on identifying key areas for oyster reef restoration that would provide water filtration benefits in the Pamlico Sound," says Seth Theuerkauf, scientist at The Nature Conservancy and National Oceanic and Atmospheric Administration, NC State Ph.D. graduate, and lead author of a paper describing the research. "Globally, less than 15% of the historic distribution of oyster reefs remain, so restoration efforts have to focus on efficiency. The current challenge is to identify areas where restoration efforts would yield maximum ecosystem services."

Theuerkauf and NC State colleagues David Eggleston, professor of marine sciences, and Brandon Puckett, former NC State Ph.D. student and current research coordinator for the North Carolina Coastal Reserve, utilized GIS tools to develop a model that could predict the best locations for oyster bed reestablishment that would provide maximum likely water filtration benefits.

"Typical models currently focus on basic environmental factors, such as water salinity and the restoration's impact on other uses of coastal space, like fishing or boating," Theuerkauf says. "Our model goes beyond that and takes into account the impact and variation in ecosystem services oyster reefs provide."

The researchers developed three versions of their model: one that identified areas where oyster restoration yielded maximum water filtration benefits; one that identified areas that would best sustain the overall oyster population; and another that identified areas with a balance between water filtration and population enhancement.

"We are excited that this tool has proven useful to guide local restoration efforts such as the Swan Island Oyster Sanctuary restoration project currently underway in North Carolina," Theuerkauf says. "The beauty of this model and approach is that it can be modified for use in a number of different habitat restoration efforts, such as mangrove restoration in Florida, where the benefits the habitat provides are different from those of oyster reefs, but similarly very valuable."

The research appears in *PLOS ONE*. Funding was provided by North Carolina Sea Grant and Space Grants, the National Defense Science and Engineering Graduate Fellowship, and the National Science Foundation.

Reference: S.J. Theuerkauf, D.B. Eggleston, and B.J. Puckett. 2019. Integrating ecosystem services considerations within a GIS-based habitat suitability index for oyster restoration. *PLOS ONE* 14(1): e0210936 DOI: 10.1371/journal.pone.0210936

Source: https://www.sciencedaily.com/releases/2019/02/190211131530.htm

Recent Publications

Journal Articles

The list below provides a selection of research articles focusing on PFASs.

- Subtle morphometric, behavioral and gene expression effects in larval zebrafish exposed to PFHxA, PFHxS and 6:2 FTOH
  Annunziato, K.M., C.E. Jantzen, M.C. Gronske, and K.R. Cooper. 2019. Subtle morphometric, behavioral and gene expression effects in larval zebrafish exposed to PFHxA, PFHxS and 6:2 FTOH. *Aquatic Toxicology* 208: 126-137.

- Perfluoroalkyl substances in adolescents in northern Norway: Lifestyle and dietary predictors. The Tromsø study, Fit Futures 1.
  Averina, M., A. Furberg, J. Brox, and S. Huber. 2018. Perfluoroalkyl substances in adolescents in northern Norway: Lifestyle and dietary predictors. The Tromsø study, Fit Futures 1. *Environment International* 114: 123-130.

- Effects of steaming on contaminants of emerging concern levels in seafood
  Barbosa, V., A.L. Maulvault, R.N. Alves, C. Kwadijk, M. Kotterman, A. Tediosi, M. Fernández-Tejedor, J.J. Sloth, K. Granby, R.R. Rasmussen, J. Robbens, B. De Witte, L. Trabalón, J.O. Fernandes, S.C. Cunha, and A. Marques. 2018. Effects of steaming on contaminants of emerging concern levels in seafood. *Food and Chemical Toxicology* 118: 490-504.

- Molecular and phenotypic responses of male crucian carp (*Carassius auratus*) exposed to perfluorooctanoic acid
  Dong, H., G. Lu, Z. Yan, J. Liu, and Y. Ji. 2019. Molecular and phenotypic responses of male crucian carp (*Carassius auratus*) exposed to perfluorooctanoic acid. *Science of The Total Environment* 653: 1395-406.

- Perfluoroalkyl substances (PFASs) in edible fish species from Charleston Harbor and tributaries, South Carolina, United States: Exposure and risk assessment
  Fair, P. A., B. Wolf, N. D. White, S. A. Arnott, K. Kannan, R. Karthikraj, and J. E. Vena. 2019. Perfluoroalkyl substances (PFASs) in edible fish species from Charleston Harbor and tributaries, South Carolina, United States: Exposure and risk assessment. *Environmental Research* 171: 266-77.

- Simultaneous determination of legacy and emerging per- and polyfluoroalkyl substances in fish by QuEChERS coupled with ultrahigh performance liquid chromatography tandem mass spectrometry
  Gao, Y., O. Zhang, X. Li, X. Li, and H. Li. 2018. Simultaneous determination of legacy and emerging per- and polyfluoroalkyl substances in fish by QuEChERS coupled with ultrahigh performance liquid chromatography tandem mass spectrometry. *Analytical Methods* 10(47): 5715-5722.

- Perfluorooctanoic acid (PFOA) and perfluooctane sulfonate (PFOA) induce different modes of action in reproduction to Japanese medaka (*Oryzias latipes)*
  Kang, J. S., T. Ahn, and J. Park. 2019. Perfluorooctanoic acid (PFOA) and perfluooctane sulfonate (PFOS) induce different modes of action in reproduction to Japanese medaka (*Oryzias latipes*). *Journal of Hazardous Materials* 368: 97-103.

- Nontarget mass spectrometry reveals new perfluoroalkyl substances in fish from the Yangtze River and Tangxun Lake, China
  Liu, Y., M. Qian, X. Ma, L. Zhu, and J.W. Martin. 2018. Nontarget mass spectrometry reveals new perfluoroalkyl substances in fish from the Yangtze River and Tangxun Lake, China. *Environmental Science & Technology* 52(10): 5830.

- Perfluoroalkyl acids in fish of Italian deep lakes: Environmental and human risk assessment
  Mazzoni, M., A. Buffo, F. Cappelli, S. Pascariello, S. Polesello, Stefano, et al. 2019. Perfluoroalkyl acids in fish of Italian deep lakes: Environmental and human risk assessment. *Science of the Total Environment* 653: 351-358.

- Formation of PFAAs in fish through biotransformation: A PBPK approach
  Mittal, V.K. and C.A. Ng. 2018. Formation of PFAAs in fish through biotransformation: A PBPK approach. *Chemosphere* 202: 218-227.

- Blood transcriptomics analysis of fish exposed to perfluoro alkyls substances: Assessment of a non-lethal sampling technique for advancing aquatic toxicology research
  Rodríguez-Jorquera, I. A., R. C. Colli-Dula, K. Kroll, B. S. Jayasinghe, M. V. P. Marco, C. Silva-Sanchez, G. S. Toor, and N. D. Denslow. 2018. Blood transcriptomics analysis of fish exposed to perfluoro alkyls substances: Assessment of a non-lethal sampling technique for advancing aquatic toxicology research. *Environmental Science & Technology* 53(3): 1441-452.

- Survey design for quantifying perfluoroalkyl acid concentrations in fish, prawns and crabs to assess human health risks
  Taylor, M.D. 2019. Survey design for quantifying perfluoroalkyl acid concentrations in fish, prawns and crabs to assess human health risks. *Science of the Total Environment* 652: 59-65.

- Bioaccumulation of perfluoroalkyl substances in exploited fish and crustaceans: Spatial trends across two estuarine systems
  Taylor, M. D., J. Beyer-Robson, D. D. Johnson, N. A. Knott, and K. C. Bowles. 2018. Bioaccumulation of perfluoroalkyl substances in exploited fish and crustaceans: Spatial trends across two estuarine systems. *Marine Pollution Bulletin* 131: 303-13.

Upcoming Meetings and Conferences

International Association for Great Lakes Research 62nd Annual Conference
June 10-14, 2019
Brockport, NY

2019 Gulf and South Atlantic Shellfish Conference
August 4-7, 2019
Savannah, Georgia

International Conference on Molluscan Shellfish Safety (ICMSS)
September 19, 2019
Ensenada, Baja California

Organization of Fish and Wildlife Information Managers Annual Conference
October 6-10, 2019
Shepherdstown, West Virginia

Additional Information

This monthly newsletter highlights current information about fish and shellfish.

For more information about specific advisories within the state, territory, or tribe, contact the appropriate state agency listed on EPA's National Listing of Fish Advisories website at https://fishadvisoryonline.epa.gov/Contacts.aspx.

For more information about this newsletter, contact Sharon Frey (Frey.Sharon@epa.gov, 202-566-1480).